

WESTERN AUSTRALIA
DEVELOPMENT DESIGN
SPECIFICATION

D3

**STRUCTURES
BRIDGE DESIGN**

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DEVELOPMENT DESIGN SPECIFICATION D3 STRUCTURES/BRIDGE DESIGN

GENERAL

D3.01 SCOPE

1. This section sets out design considerations to be adopted in the design of structural engineering elements for land subdivisions. Such activities will include:

- Road traffic bridges
- Pedestrian bridges
- Structures other than bridges, but associated with roads (eg major culverts, retaining walls, major sign support structures)
- Small earth dams, detention basins
- Structures used for public safety (road safety barriers, pedestrian safety rails, street lighting)
- Temporary works

Such structures may be of concrete, timber or steel constructions, but with emphasis placed on low maintenance.

D3.02 OBJECTIVE

1. The aim of design shall be the achievement of acceptable probabilities that the structure being designed will not become unfit for use during its design life, having regard to economic, physical, aesthetic and other relevant constraints.

Design Life

D3.03 BASIS OF DESIGN

1. The design shall be based on scientific theories, experimental data and experience, interpreted statistically as far as possible. The safety and service performance of a structure depends also on the quality control exercised in fabrication, supervision on site, the control of unavoidable imperfections and the qualifications, experience and skill of all personnel involved. Adequate attention shall therefore be given to these factors. In addition, adequate management control and supervision by experienced engineers shall be required at all stages of design and construction to prevent the occurrence of gross errors.

***Safety Quality
Qualifications***

2. Specifications shall be notated on the Drawings with sufficient detail to ensure that the above described strategies are able to be effectively implemented at the construction stage.

D3.04 REFERENCE AND SOURCE DOCUMENTS

(a) Council Specifications

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| D1 | - | Geometric Road Design |
| D5 | - | Stormwater Drainage Design |
| D7 | - | Erosion Control and Stormwater Management |

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(b) Australian Standards

- AS1158 - The lighting of urban roads and other public thoroughfares (SAA Public Lighting Code)
 - AS1170 - Minimum design loads on structures (SAA Loading Code)
 - AS1684 - National Timber Framing Code
 - AS3600 - Concrete structures
 - AS3700 - Masonry in buildings (SAA Masonry Code)
 - AS/NZS 3845 - Road safety barrier systems
 - AS4100 - Steel structures
- Other relevant codes and guidelines with the above.

(c) Other

- AUSTROADS - Bridge Design Code
- Inst. of Eng. - Australian Rainfall and Runoff
- KD Nelson - Design and Construction of Small Earth Dams

D3.05 ROAD TRAFFIC AND PEDESTRIAN BRIDGES

1. Bridge design shall only be carried out by properly qualified persons whose Association of Consulting Engineers Australia (ACEA) listing includes structural design of bridges in its claimed area of competency. Such designers shall submit evidence of these qualifications to Council prior to approval of any bridge design **A.C.E.A. Listing**
2. However, this does not preclude submissions by other qualified persons in which cases Council reserves the right to call for evidence of the qualifications and experience of the responsible designer; or to seek referral of the design calculations to an appropriate A.C.E.A. firm for checking. The latter requirement will be at the Developers cost, if directed. **Design Checking**
3. The AUSTROADS Bridge Design Code shall be used for all bridge design.
4. Bridges shall have low maintenance finishes. Adequate precautions shall be taken for protection of the materials used in the bridge design; for example, timber and steel require special consideration. Heavy debris and bed loads may be characteristic of some streams so that large spans with slender piers are encouraged. If overtopping is permitted, pedestrian safety rails and road safety barriers are usually omitted. Flood depth indicators and appropriate signposting will be provided in such cases. **Finishes, Debris, Overtopping**
5. Preventative maintenance is a key issue affecting the design life of the structure. The Drawings shall specify the design life of the structure together with the relevant maintenance programs to be adopted upon which the design life is based. Parameters used in the design shall also be shown on the Drawings. **Design Life Maintenance**
6. Hydraulic design of bridges shall be in accordance with the requirements for major structures in the Specification for STORMWATER DRAINAGE DESIGN. **Hydraulic Design**
7. Where structures are designed to be inundated, the effect of the backwater gradient on upstream property shall be identified on the Drawings. **Inundation**
8. . Where no inundation is permitted, appropriate afflux shall be adopted together with a 500mm freeboard to the underside of the bridge deck. **Freeboard**
9. Designers should enquire regarding current or likely provision for public utilities in bridges. These should be concealed for aesthetic reasons **Public Utilities**

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D3.06 PROVISION FOR PEDESTRIANS ON ROAD BRIDGES

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| 1. | Provision for pedestrians on bridges is required in rural residential as well as urban areas. The minimum provision is a 1.5m footpath with kerb at the road traffic edge and pedestrian safety rails at the external edge. | <i>Minimum Provision</i> |
| 2. | Council may require the provision of separate pedestrian footpaths in other situations should the anticipated traffic warrant it. | <i>Separate Footpaths</i> |
| 3. | Disabled access shall be considered in the design. | <i>Disabled Access</i> |
| 4. | Urban bridge approaches should be lit in accordance with AS1158. | <i>Lighting</i> |

D3.07 STRUCTURES OTHER THAN BRIDGES, ASSOCIATED WITH ROADS

1. Public utility structures, major culverts, major sign support structures, retaining walls, and the like will be designed by a competent, practicing engineer, accredited in the design of such structures. The design shall be in accordance with the AUSTROADS code, all relevant Australian Standards, and the requirements of any utility owners that may be relevant.

D3.08 SMALL EARTH DAMS/DETENTION BASINS

1. Small earth dams may be designed following the guidelines in "Design and Construction of Small Earth Dams" by K D Nelson together with relevant geotechnical recommendations. The structural design of weir outlets to resist failure shall be considered in design. Refer also to the Retarding Basin and Stormwater Detention sections in the Specification for STORMWATER DRAINAGE DESIGN.

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| 2. | Childproof fencing may be nominated where it is a requirement of relevant statutory regulations, Australian Standards or Council Specifications and where unacceptable risk exists due to the location of the dam/basin in relation to the urban nature of the area. | <i>Fencing</i> |
| 3. | The Designer shall carry out the design with recognition of the potential risk on existing and planned infrastructure downstream, assuming the probability of dam/basin failure. | <i>Risk of Failure</i> |
| 4. | The Designer shall be a qualified civil or structural engineer having accreditation in the design of such structures. | <i>Qualification</i> |
| 5. | The Designer shall be required to certify the design and ultimately certify the work-as-executed Drawings for compliance with the design. All relevant details shall be shown on the Drawings. | <i>Certification</i> |

D3.09 STRUCTURES USED FOR PUBLIC SAFETY

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| 1. | Since the requirement of road safety barriers and pedestrian safety rails on bridges are different, the design engineer shall consider whether separate traffic and pedestrian barriers can be detailed to satisfy the major functional requirements. | <i>Barriers and Rails</i> |
| 2. | The AUSTROADS Bridge Design Code and AS/NZS 3845 are recommended references in this regard. | |

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3. It is essential that all safety barriers and rails have been fully tested and accredited for the intended use under quality assurance provisions.

4. Bridge crossings in urban and rural residential areas shall be provided with streetlighting in accordance with AS 1158. Such requirements will be noted accordingly on the Drawings.

Lighting

D3.10 TEMPORARY WORKS

1. Structures which are proposed for the temporary support of roads, services and the like shall be designed by a qualified Engineer experienced and accredited in the design of such structures and designed in accordance with the AUSTRROADS Bridge Design Code. A construction programme, indicating the sequence of events leading to the implementation and removal of the temporary structures shall be specified on the Drawings.

***Programme of
Temporary
Provisions***

SPECIAL REQUIREMENTS

D3.11 RESERVED

D3.12 RESERVED

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